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UNIFIED MESSAGING, PART II
by Jerry Michalski

The handheld and desktop devices covered in December's issue require complementary back-end services if the information environment is to help people manage their communications. For example, a normal answering machine takes messages one at a time, and not while you're on the phone. An answering service can take multiple messages simultaneously and doesn't care if you're on the line. If you are on the road, it doesn't make sense for messages to go all the way to your desktop machine, which then reroutes them to you. It is much more efficient for the network to find you and route the messages directly, as long as it can find you. This issue covers such back-end services at the departmental, corporate or network level, and their residential counterparts -- the household, neighborhood and network.

The messaging server and services markets are in turmoil. Some technologies formerly seen as strictly voice or data are crossing over: faxes are climbing aboard pc networks; voice-response systems are querying and updating databases; pcs are sending messages to pagers; TV and videoconferencing are showing up inside pcs, as are synthesized voices; PBXs are starting to talk to pcs outside the call center; and screen phones -- primitive data terminals -- are hitting the retail market. With plenty of fiber backbones in place and fast, economical ways of transmitting information emerging, carriers are trying to identify what value they can provide in the long run. If the local cable and utility companies can also run a line to a home or business, what is the role of the local phone company, especially when it is forbidden to add value by the Modified Final Judgement?

The functional crossover and changing economics have many companies concerned: Those that are not concerned are asleep and won't last the decade. They are suffering an identity crisis, but the voice and data markets are not disappearing into each other; participants still view the world from their businesses of origin. To illustrate this point, here are two equally plausible scenarios for the next five years:

Computer conquest

In this scenario, information and communication are controlled in-house, not on the network. MIS expands its computing charter and becomes the integrated communications powerhouse. Multimedia e-mail becomes the principal ⟹

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INSIDE

MESSAGING REDUX 1
Two scenarios.
Transit tactics.
IN THE CLOSET OR BASEMENT 6
MVIP and Mitel.
ATM and its effects.
Edify's Information Agents.
ON THE NETWORK CLOUD 12
AT&T's UMA.
AccessLine.
RESOURCES & CALENDAR 17
Names, phones, dates.
Forum update, page 18.

messaging backbone. The corporate phone system, now run by MIS, goes client/server. The phone-enhanced pc becomes the dominant business-user terminal. Security and privacy issues keep sensitive information off the public networks. (After all, that's not where you want your corporate directory floating around, is it?) E-mail directories become the repositories for complex information about organizations, resources and users, but remain essentially internal to companies. Intelligent hub vendors install fast-packet networks that work LAN-to-LAN and can carry any kind of data (see ATM, page 9), bypassing traditional phone equipment altogether. Wireless services (**Release 1.0**, 10-92) are integrated with on-premises hubs, serving pocket phones, PDAs and personal communicators. MIS loves the savings: No more buying and maintaining separate voice and data servers. And it loves the control.

This is a telecommunication vendor's nightmare. PBXs are rendered obsolete (a process facilitated by the rotten dynamics of the PBX market, page 6) as intelligent hub vendors team with phone-system vendors that have decided to embrace the data world (see Mitel, page 8). Handsets are built and sold mail-order by pc and consumer-electronics companies. Phone companies lose clout: Once their network is a seamless, multimedia web of pipes, they compete with new entrants such as cable TV to sell generic bandwidth and a few signalling functions, which data-side companies harness to provide a slew of new features.

This scenario requires enormous cooperation and integration on the part of vendors, integrators and carriers; otherwise only the largest corporations will be able to afford such infrastructures. If history is any guide, the data-system vendors may not be able to make their offerings simple enough for anyone to buy, install and use. Finally, since systems will be built around premises equipment, geographic coverage may be a problem.

Communications outsourcing

In this scenario, data-oriented vendors never get past e-mail addresses and arcane message gateways, which are too cumbersome for users. MIS fails to take in communications systems and ends up as the Computer Department (with a charter limited to computing, a mature technology). The phone system -- which could be a local carrier, long-distance carrier, cellular carrier *or* cable TV company or any combination of these -- does it better. Services are hosted on and delivered through the network cloud (see AccessLine, page 13). Cordless, cellular and screen-based phones become the dominant terminals; the phone keypad, enhanced with voice-response cues, touch-screen soft keys and eventually speech recognition, is the primary user interface. It may be a pc, but with software from communications guys. Critical information (e.g., corporate directories, transaction files, routing tables and rules) is stored in trusted systems (page 16) on the network cloud. Data vendors flourish. Security is tight; encryption is the rule. Small companies can also subscribe to sophisticated services. Geographic coverage is a breeze.

The communication carriers have many advantages, including ubiquitous terminals addressed with a single, easy-to-use numbering scheme that works, and a massive infrastructure that exists today. In fact, the combination of a phone company's lines and trunks, a cellular carrier's wireless coverage and a cable company's access provides astounding multimedia reach.

The carriers *have* to make this work: When fiber is everywhere and cheap, the only path to survival is enhanced services. With a few exceptions (e.g., the highly competitive, low-margin PBX world), both the data vendors and the communication carriers have funds for R&D. It's worth noting that users win in both scenarios because vendors and carriers are driven to provide richer, more usable services.

So close...

As the two scenarios illustrate, the voice and data realms meet -- but just barely. On one hand, data dudes still don't *get* voice traffic; they see telephones as pesky peripherals they'd rather do without, rather than as ubiquitous, low-function terminals. On the other hand, phone companies view the handset (eventually the screen phone) as all that's needed; few are working to extend their systems to encompass PDAs and other portable data devices that hold the users' personal information. Such non-phone, data-rich devices will play a critical role, because schedules, directories and to-do lists are deeply linked to communication with others. Smooth integration between personal information and message- and call-management functions is essential.

The two scenarios describe extreme positions. It's hard, for example, to see voicemail systems obsoleted by voice-enhanced e-mail anytime soon: LANs and hard disks aren't up to the volumes of information, and pcs aren't nearly as ubiquitous as phones. It's also hard to imagine data vendors rolling over and playing dead while carriers steal their business. What falls in between? Here are two options: Destructive competition or wary, narrowly focused alliances.

Destructive competition results in the fragmentation of markets and services, and almost nobody emerges a winner. Consumers are confused by the proliferation of electronic books, interactive TV, personal electronics, CD-ROM games and videophones. New network offerings don't convince people of their value, or their message (however valuable) gets lost in the shuffle next to interactive TV, etc. PBXs manage to survive by adding access options, some wireless phone capabilities and rudimentary pc-PBX integration. Computer-industry margins decline, and differentiation is nearly impossible. Information providers launch new services, which do not reach large audiences because they don't integrate well with users' tools and work patterns. The losers in this option are users, who must use new communications technologies to do business, but don't get more functionality or a simpler information environment. The losers behind the scenes are the corporate network managers, whose lives become miserable.

Wary alliances make much more sense. They hinge on collaboration between on-premises machines and network services (and their vendors) to enhance the value of handheld and desktop devices, wherever they are located. This is a distributed-intelligence scenario, characterized by devices with a trainable, adaptable user interface that work hand in glove with a smart network. This interface (such as one forthcoming from General Magic) is critical, because the basis for differentiation in messaging, broadly defined, is shifting away from simple call-management features to overall support for *user* activities. Take, for example, a meeting: The fact that the meeting has four participants on video, five with shared-document displays and three listening in from phone booths or cellular phones should

fade into the background. The fact that it was scheduled over a network scheduling package that coordinated activities with a dozen different PIMs should, too. Other models are likely, but the key is a behavioral, not technological, emphasis. The resulting components will be distributed across the architecture, based on users' needs and patterns of activity.

The dynamics of getting from today's infrastructure to tomorrow's spell the difference between growth and stagnation. They affect industries as varied as pcs, personal electronics, cable TV, telephone service (local, cellular and long distance), and telephone equipment.

The black hole of conventional wisdom

Many industry leaders are trapped by their perception of their markets' structures. Unwilling or unable to question their basic premises, these players fall inexorably into competitive, low-margin markets. The pc business, for one, enforces a narrow range of product features and heavy price competition; pc software is stuck at $300 street prices that require monstrous advertising budgets to promote (though lately Microsoft and Borland have done their best to destroy even those margins). The PBX market is cutthroat, as is the market for voice capacity from carriers. It's not just a matter of price competition: The dynamics affect product design and user perceptions, too.

Huge opportunities are on the table, not the least of which is owning the high-capacity channel into consumers' homes and the devices and services they use. Yet it's easy to lose hope amidst the fits and starts of technologies key to unified messaging, such as pen computing, ISDN, X.400 and X.500, and wireless data communications. We face chicken-and-egg market dynamics: Nobody will build networks without the devices, and vice versa.

The way out of the black hole is to drop preconceptions and focus on buyer value and needs. Unfortunately, buyers are just as likely to be caught in the black hole's pull, so standard focus groups and interviews often return faulty information that reinforces the status quo.

From tactics to strategies

Companies that can free themselves from the black hole acquire a sort of X-ray vision, which lets them see existing (or soon-to-exist) services and equipment in new ways. In some cases a small incremental investment can build the functions of next-generation equipment by leveraging today's infrastructure. What emerge are transit tactics (see box) that help not only to deliver interim services, but also to create awareness and demand for the broader concepts at stake.

The next two sections of this issue pick up where December's issue left off, and map to the two scenarios described above: In the "Closet or Basement" section we focus on data services with intelligence and equipment on premises; in the "Network Cloud" section, we look at phone services with network intelligence. Where possible, we cover companies that are closest to bridging the two worlds.

Technologies in transit

Discontinuous technological change is riskier than evolutionary change. Transit tactics are a way of piggybacking on near-term products and services to achieve more ambitious, otherwise unattainable long-term goals. Transit-system components are designed to be swapped out when the sought-after service (say, ISDN) is available. Here are examples of how some vendors are providing the value of ISDN, wireless data networks and single personal phone numbers sooner than might otherwise be possible:

Useful information about calls moves between most phone-network switches, but seldom makes it beyond the local switch to a business or household, where it could be put to use. User devices are all treated as if they are dumb. ISDN promises smarter communications by using the network information; however, ISDN is taking forever to roll out. Carriers are starting to use the Analog Display Services Interface (ADSI) to support emerging smart phones, such as those recently unveiled by AT&T, Northern Telecom and Philips. (ADSI is a simple way of sending short data and call-status messages over an ordinary analog phone line; it is not the same as ADSL, the Asymmetric Digital Subscriber Loop, which is used for interactive TV.)

Developers of devices such as PDAs and personal communicators have seized on ADSI as a convenient (and surprisingly rich) workaround between POTS (plain old telephone service) and ISDN. A PDA or communicator that speaks ADSI and looks like a TV remote control would be in people's hands all evening; what an easy way to place orders on the Home Shopping Network. Two ADSI-speaking PDAs linked to a phone conversation could exchange business-card information over the phone during the call. A vendor could write an application-development environment that works with all the protocols (e.g., voice response, ADSI, faxes, PDAs and personal communicators, or ISDN devices), adapting to each mode's added functionality.

The second example of a transit technology is Cellular Digital Packet Data (CDPD; see Release 1.0, 10-92). CDPD lets carriers offer wireless data service without building from scratch by leveraging the existing cellular infrastructure.

The third example is permanent single-number access to individuals, which may take a long time to deliver. In the interim, AT&T offers its EasyReach service (our 0-700-CURIOUS); AccessLine (page 13) offers even more sophisticated functions, coordinated by a database it licenses to carriers. As a result, users can learn to deal with a single number -- or better, an alias -- sooner rather than later. With consumers demanding the service, carriers are likely to increase the speed of ISDN deployment to support it.

IN THE CLOSET OR BASEMENT

This section of the issue starts by examining the dynamics of the PBX market. It then covers two standards (MVIP and ATM) and two vendors (Mitel and Edify) that exemplify the future of local unified-messaging systems. At the end is a sketch of how consumers will be provided with unified messaging services.

Companies need an intelligent communications controller. Until now, that has typically been the PBX, accompanied by voicemail processors. Now data hubs are growing beyond data services; eventually, they will vie for voice communications. The opportunity is there, because phone-system vendors don't understand voice communications. They understand billing, they understand uptime and hot-pluggable replacement parts, but they don't understand personal communications. If they did, the phone system could do much more for its users.

The PBX as mainframe

The dynamics of the PBX business support this thesis. Trailblazing PBX vendors had to invent their own "standards" in order to differentiate themselves with advanced features in a world devoid of genuine standards (and with a network controlled by monopolistic, protective carriers -- the PTTs). As a result, you can't walk to 47th Street Photo and buy a handset to plug into your office PBX. Adopting standards and opening their platforms would threaten phone-system vendors way of life, so they have perpetuated the status quo. Now they are trapped in it.

Star (*) Wars

The battles over use of the infernal asterisk on telephone keypads illustrate the rigidity of the phone world. An ANSI standards group, X3V1.9, has been working on a uniform interface for the keypad. The idea is to standardize command sequences so that, for example, the same command will delete a message on any voicemail system. Problem is, there are two camps that cannot reach resolution. The battleground: the asterisk. The camp representing feature-rich corporate systems wants the asterisk reserved as a command introducer (e.g., "*57" means "I'm out to lunch"). The other camp favors super-simple consumer systems, and wants the asterisk to be a command of equal status with all the others (e.g., "*" = delete, "2" = fast forward). Although agreement on the use of interfaces is important, there are major changes afoot elsewhere that will rapidly make this issue moot.

PBX vendors make money in the aftermarket -- on service, handsets and processor power (via new features). As long as their sets have custom buttons and their protocols are proprietary, nobody can build replacements. They defend their software by making it monolithic and closed: Software features are bundled with the proprietary PBX software -- take it or leave it. The features are difficult to use because every vendor implements them differently, and also because the protocols presuppose a terminal device with little intelligence. As a result, hardly anyone uses the extra features;

with the exception of touch-tone dialing, answering machines and voicemail, voice communications have hardly changed in 40 years.

Where profitable, as in call centers, the phone-system vendors have integrated their systems with "foreign" systems and provided customized functionality. PBX vendors had no incentive to adopt ISDN, because it would suck into the network cloud the services that they were providing on premises (e.g., call forwarding, conference calling). The vendors defended this strategy by saying it's the only way to have secure, disaster-proof systems. Sound like a mainframe to you?

Now some PBX vendors are loosening the reins and connecting to other machines. Host-to-PBX standards such as SCAI (the switch/computer application interface) are a start. The recently announced Novell/AT&T Telephony Services is an example at the LAN-to-PBX level; it is a NetWare Loadable Module that passes data and events between phone systems and Novell LANs. In fact, many software and phone-equipment companies (such as Octus and Northern Telecom, or Microsoft and InteCom) are jointly developing connectors and software that allow a pc to drive a phone using a series of speed-dial buttons on screen, accompanied by a list of pending messages and a shared directory.

Some of these emerging alliances will allow companies near the edge of the black hole to escape, if they care to. While the pc-as-phone model provides a useful, still uncommon function, it will not be enough to keep the phone-system vendors out of harm's way. Most front-end devices are going wireless, and need to fit a mobile lifestyle. On the back end, the trend is toward open (dumb) switches controlled by general-purpose processors running modular software; this way companies can ride the performance and cost curves of those platforms. Ultimately switches and circuits dissolve into multiplexers and virtual circuits.

While reliability equivalent to a phone's can't be obtained by slapping phone boards into pcs that are liable to crash at any minute, an alternative architecture could easily emerge. Intelligent hubs with uninterruptible power supplies, redundantly connected networks and wireless controller modules could serve battery-powered wireless handsets. During a power failure, only the rechargers would fail; the handsets would still work. Any portable devices that could handle the functions of a phone would thus continue to be reliable.

Clearly intelligent-hub vendors have a chance to take a piece out of the voice market. But they don't understand voice communications yet. One path toward such an understanding is through collaboration on platforms that cut across both domains; MVIP is such a platform.

MVIP: Piece parts for voice processing

In September 1990 six companies -- Natural MicroSystems, Mitel (covered below), Promptus, GammaLink, Brooktrout, Scott Instruments and Voice Processing Corp. -- drew up a specification called the Multi-Vendor Integration Protocol (MVIP) that lets ordinary pcs host multiple, real-time communications functions such as call processing, speech synthesis, voicemail, voice response and fax response. MVIP is not yet plug-and-play, but rather is intended for integrators and OEMs that want to sell departmental applica-

tions. The MVIP Forum will announce higher-level APIs soon; MVIP II, a fast-packet, multi-chassis specification that will support larger applications, is under development[1].

Mitel: If you can't fight 'em, join 'em

Mitel, a key MVIP participant, reinvented itself in January 1990 following a crisis that left the company, a traditional PBX vendor, barely in the black. Having sold analog PBXs since 1978 and digital ones since 1982, Mitel hit bottom in 1989 when British Telecom put its 51 percent ownership of Mitel on the block, throwing doubt on Mitel's viability as a traditional PBX vendor. Its attention sharply focused by impending doom, Mitel's management redesigned the company. It deconstructed the PBX, making its offerings modular and distributed, and creating a direct sales and service organization to sell and support them. To simplify wiring of its new, distributed PBX, Mitel's engineers made all the lines digital, using low-cost plastic fiber, and turned to multiplexing to replace the hundreds of cables needed to manage traditional circuits. The redesigned PBXs shipped in volume in March 1992, and are outselling Mitel's old products. (Mitel's 1991 revenues were $350 million.)

Mitel also entered the OEM component business with its new Communicating Objects Division (COD), whose mission is to bring telecom expertise to the computer industry. Mitel has rearchitected its systems for a distributed, multivendor architecture, just like its cannier counterparts on the data side. Part of this redesign focused on the availability of Asynchronous Transfer Mode technology (see below). ATM is more than just a faster pipe: It is a signalling protocol that can set up other communication services.

ATM is not just a new connection option. Compelling new ideas emerge when you assume ATM is available and rethink the rest of the infrastructure.

-- David Cork, Mitel

Though it's not talking much now, Mitel is developing products of its own and for OEMs that harness this power. The company's new strategy and structure were attractive enough that Schroeder Ventures bought BT's stake in mid 1992; since then, Mitel's stock price has doubled. Data-oriented vendors have enthusiastically received Mitel's new attitude and offerings.

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1 *To get more bandwidth than a pc backplane offers, MVIP specifies a ribbon cable that that runs across the top of boards placed in ISA, EISA or Micro Channel slots. The cable is a time-division-multiplexed bus with eight 2-Mbps channels, which allows 256 64-Kbps bidirectional sessions to take place in a single pc chassis. If more than 64 Kbps is needed for an application, several 64 Kbps channels can be grouped together. The boards can include phone ports, a switch, fax cards (for fax response, fax broadcast), voice-processing cards (voice response, audiotex, speech recognition, voicemail), network interface cards, and video cards.*

Can Mitel convince people of the dramatic changes possible by rethinking premises equipment for ATM, or will the existing PBX vendors survive by providing ATM access at their central site? We hope Mitel pulls it off. IBM could learn a lesson about redesigning itself from Mitel.

It's not an Automated Teller Machine or Adobe Type Manager...

Asynchronous Transfer Mode, often referred to as cell relay (though the two are not the same; see box), is an access and data-transport technology that forms an integral part of the Advanced Intelligent Network, alongside the Synchronous Optical Network (SONET) and broadband ISDN (B-ISDN).

Viva ATM

As an access method, ATM is similar to ISDN: It places an order for communications services, allowing a machine to configure transport services according to an application's needs. Need a video spigot? ATM asks for it. Need a slow drip? ATM can handle that, too. ATM first reserves, then opens a virtual circuit. All packets for that session try to take that path; corrupted packets get chucked. Unlike X.25, which performs substantial error-checking along the way, cell relay typically relies on the sending and receiving applications to do their own checking.

ATM has such capacity and low latency that it can act as the carrier for many different kinds of data, including live voice and video. It can also host different service offerings, including cell relay, a high-speed, fixed-length packet service; and frame relay, a variable-length packet service suitable only for deferred traffic. Cell relay achieves its speed by breaking information into tiny packets that require very little processing at any intermediate stage.

This invariant approach -- all packets are the same size -- means ATM can be designed directly into silicon, making it faster and less expensive over time. In order to achieve low overhead, ATM uses local addressing -- rather like giving a traveler instructions to go ten miles and turn left, then go five miles and turn right, instead of telling him to get to Milford Junction and take Route 66 to Dogpatch Run.

ATM is not just a common transport for voice and data: It is the foundation for new information architectures, and changes some existing beliefs. Though it will be at least two years before customers feel the impact of ATM and its companion technologies, the change in mindset should begin today. For example, ATM and other speedy systems make the backbone surprisingly fast, and reduce the difference between local-area and wide-area communications. There is hardly any lag between sending a message and receiving it, changing the nature of real-time and store-and-forward systems from the users' perspective. They can now decide how to communicate based on task and context. (This is what we mean when we describe new user interfaces developed around user behavior, not around the artifacts of the communication infrastructure. Otherwise, messaging stays focused on a store-and-forward model.)

On the operations side, ATM does not fit well with current telephone industry billing concepts. For example, if a voice session is handled using milliseconds of capacity, how should the bill read? What can the carrier charge for 88 milliseconds? Besides, billing systems designed for per-call itemized bills are already overwhelmed.

EDIFY: CLOSET AGENTS

MVIP is for OEMs; ATM is a concern for network architects. Edify's technology addresses managers in corporations who want to build message-system-independent applications quickly.

From a unified messaging perspective, the power of Edify's programmable Information Agents (see **Release 1.0**, 2-92) is that they combine message management with message-system independence. An Edify system can communicate with people through touch-tone menus and faxes (similar to a voice- or fax-response system), with applications through terminal emulation, and with either through e-mail. It can replace workers doing small, moderately random transactions.

A company might use Information Agents to select, format and transmit monthly account status reports to clients, or daily order status to customers. Or the Agents can respond to random requests for information. The input and output mode need not be the same: A touch-tone query can lead to a faxed report. In fact, individuals in a group can list their preferred mode of receiving information, including audiotex and voicemail. Employees at semiconductor equipment maker Applied Materials fill out e-mail forms (with a password) that, through Edify's Information Agent, query a human-resources application to inquire about benefits, reallocate their retirement-plan deductions, and so forth. The Edify server queries the HR package, submits and documents changes, and formulates the replies.

Edify's remarkably clear and powerful application development tool suits it for use by departments with many tasks to automate, but no integration experience or programming staff. If people can train a clerk to do a task, they can probably "train" (program) an Edify agent to do it. Where voice-response system buyers would typically have their vendors or integrators write custom applications, Edify provides a platform that solves the integration problems and brings application development in house, much as desktop publishing brought graphics work in house. The programming can get quite complex: Query a database, sort the resulting list and run a second query against every record in the first table. Then format and transmit the reports in whatever format/medium is dictated by the first list. Edify's Information Agent is not a transaction engine, a personal software agent, a full unified messaging system, or an EDI server, but it can complement any of those.

The system facilitates quick application development. You can fax or scan in your own forms, rather than using a time-consuming (albeit more elegant and maintainable) forms designer. The system overlays report data on the scanned image, then faxes it out. Terminal emulation also speeds application development, although it is a slower method than using LU.2, APPC or other protocols. Later Edify's Agents will be able to control Windows and DOS applications directly (as BeyondMail does now). The busy-hour capacity of one $60,000, 486-based Information Server is 12 lines (10 to 12 agents working concurrently).

Recently Edify began offering Express Agents, template applications that are similar to the niche content tools described in **Release 1.0, 11-92.** Sample templates include order status, shipment notification and backlog notification. Over time, Edify will add more intelligence and senses (e.g., "listening" with speech recognition and "reading" faxes with OCR) to its Agents. It will also evolve to a distributed architecture, where Edify software controls third-party devices and applications remotely, managing the format conversions, message receipts and responses, etc., but the equipment is no longer housed in a single chassis. Object-oriented remote procedure calls are attractive, since they provide a common means for moving such requests for activity across a network.

The consumer side

For consumers with little messaging experience and few legacy systems to worry about, there are subtle equipment-versus-services issues. On one hand, telephone companies are beginning to offer more enhanced services, ranging from automatic callback to voice messaging and Caller ID. On the other hand, the cable TV boxes and wiring could do much more than just unscramble Terminator 2 (if it can be unscrambled). Soon companies will deploy souped-up cable TV boxes that attach to the outside world via turbocharged coaxial connections (did someone say 500 channels?), and that act as base stations for wireless, handheld units that play the role of a remote control -- and much more. The cable capacity easily permits phone service as well as data messaging. A whole household worth of voice and data traffic wouldn't consume anywhere near the capacity of one video channel.

The back end of the consumer infrastructure will depend on powerful neighborhood-level controllers that already exist as cable TV terminals, telephone junction boxes, local cell sites and radio-data repeaters (as TV Answer is doing for interactive TV). Once the controllers are upgraded, the carriers will end up offering each others' services to the same households.

ON THE NETWORK CLOUD

People who seldom leave their homes or offices may be well served by the local message-management systems described in the previous section. However, for telecommuters and people on the move, network intelligence is essential. Network services also imply outsourcing.

AT&T has the vision thing

AT&T has long understood the idea of a single mailbox. In 1983, fresh out of Brown University with a degree in cognitive science, Deborah Mills-Scofield joined Bell Labs as a systems engineer and was assigned to write specs for several messaging systems. Seeing that they had much in common, she wrote a single spec -- more of a feature description than a technical architecture. Working through what became the architecture-setting department at AT&T, she enlisted the efforts of representatives from each of the development groups, getting them to write their own sections of the spec.

This work evolved into AT&T's Unified Messaging Architecture (see box), which was even patented. (The patent was never defended, and will not be; it would be counterproductive.) Since then, when internal groups come to top management to propose new messaging products or services, they have to adhere to the UMA, or show why they don't.

The Unified Messaging Architecture

UMA is not a formal specification that AT&T wants to foist on the world, but instead states that messaging systems should have a single mailbox, accessible through several paths (e.g., from a phone or computer terminal) and sharing common notification, message-exchange and user-interface features. A user specifies a printer and fax, as well as a voice- and e-mail box, which become the central repository for his messages. UMA includes common operations and support, billing, authentication and verification.

Like X.400, UMA messages have an "envelope" with header information and a "stamp," which specifies the urgency of the message. The contents of the message are hidden from the system, unless the envelope specifically requests media or format conversion. UMA covers voicemail, e-mail, EDI, telex, and enclosures, which can be images or other binaries. For example, Audix (AT&T's voicemail offering) message headers are very similar to X.400 headers, which makes it easy to show them in a mailbox.

More importantly, the Architecture is evidence that AT&T has understood these problems and goals for a long time, even if it hasn't articulated them yet. In fact, early results involved the integration of AT&T's own products (e.g., 3B5 Unix machines, Audix, Enhanced Fax). Now indications are that AT&T is willing and able to participate in the creation of larger systems that act this way. AT&T has been sharing the architectural specs with interested parties for years; it also helps them to test for interoperability.

In early 1992 AT&T management chartered its EasyLink division management with coordinating all AT&T's efforts in messaging, which is one of six strategic technology initiatives at AT&T that cut across all business units[2]. The division's goal is to provide transport and conversion of messages; other divisions can provide user-agent software that performs actions on the messages, as can third parties. When AT&T integrates its products and services with NCR, McCaw (**Release 1.0**, 11-92) and any other partners, we may see interesting new permutations, such as bundled network services *and* devices for a specific application...and maybe billed to a Universal Card.

There is a strong commitment from the top of AT&T on down to change the paradigm of who controls what. The person should be in control, rather than the technology.

-- Deborah Mills-Scofield

ACCESSLINE, THE COMMUNICATIONS COORDINATOR

It's easy to say various industries are in trouble and need to find a new sources of value, but it gets tiresome unless one can point to examples of what is possible. AccessLine is one such example. As we mentioned on page 5, AccessLine is also a clever builder of transit technology.

AccessLine Technologies (formerly AccessPlus, **Release 1.0**, 10-92) provides a intelligent, network-based communication control for active people. Its software does things today that the advanced intelligent network will eventually enable. Its technology helps untangle the mess of phone and fax numbers we deal with, effectively simulating a one person, one number world. The company licenses its software to cellular carriers and telephone companies, who can then sell advanced services to subscribers (no cable TV operators license the technology). The carriers package and price the services differently, but typically basic service is under $10 per month, with extra features available for another $5 per month.

How it works

New subscribers fill out a form, which gives the AccessLine software a profile of their equipment and use patterns, and sets up call-management rules. Sample questions: When you are in your car, do you want callers automatically forwarded to your cellular phone, or do you want them screened with a PIN or urgency code? What is the latest you want to receive business calls? Personal calls? Users memorize a few simple codes: 10 means you're at home, 20 means you're at work, ready to take calls; 30 means you're at your mobile phone; 40 means you're out of town, but can be paged to a phone; and 50 means you're out of reach, please leave a message. Any of these can be combined with other call-processing features. So the subscriber calls her AccessLine, enters a PIN, then types a status code.

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2 *The other five are video, speech processing, wireless, computer scalability and data communications.*

For callers, "#" always falls through to voicemail; a fax beep will always start a fax recording, so your calls and faxes can go to the same AccessLine number. If a caller left his number in your voicemail, hitting the asterisk autodials that number automatically (yes, this is yet another use for the poor asterisk). There's more:

- Phil calls Zoe and hears a voice-response style message: "Zoe is not at her phone. If this call is urgent, please hit 'one' now, and Zoe will be paged to a phone. If you would like to leave a message, please hit 'two.'" If Phil opts to page Zoe, he is asked to wait a moment. Zoe, reading her page, walks to any touch-tone phone, dials her own AccessLine number, enters her PIN, and the phone system connects the two inbound calls.

  The pager signal can get quite detailed. It can tell you who called, that you have three unread (but not urgent) voicemail messages, and more. After you have listened to a voicemail message, pressing the asterisk automatically redials the number (captured with automatic number identification, if available, or by prompting the caller for his number).

- Subscribers can consolidate all their voicemail systems (office, home and possibly cellular) and faxes through AccessLine. Users have to check only one mailbox (voice or fax).

- AccessLine enhances existing services. For example, voicemail systems tied to cellular phones are usually dead ends: There's no place to go if you really want to talk to a person. AccessLine can provide a fallthrough to your office or any other place you specify.

- Futures: It can get more sophisticated. You type "30," the system responds, "How long will you be in your car?" You answer "120," and it asks, "Then where will you be?" You reply "40." AccessLine is testing speech recognition, so users can say "I'm at home" instead of keying "10." Text-to-speech technology could read the subscriber the header information from a fax ("the five-page fax is from EDventure Holdings"). It could also be displayed on the subscriber's pager. E-mail connectivity will be added as licensees demand it. Enhanced Call Waiting could offer inbound callers three options -- hold, leave voicemail, or enter a PIN to interrupt the current call. No PIN, no interruption.

As early focus-group feature ideas proved impractical, AccessLine refined its offering, focusing especially on the calling party's experience. For example, early systems had a feature that let subscribers define a hunt pattern: A caller would be put on hold and successive phone numbers would be rung, until the subscriber was located. This proved too time-consuming and cumbersome; callers wouldn't hold for that long. AccessLine also smoothed the synthetic operator's voice and comments, making them more pleasant for callers.

AccessLine's basic technology was invented by Bob Fuller, whose company, US Communications, used to sell cellular gear to carriers. (Fuller is now on AccessLine's board; he sold US Communications to EF Johnson.) In 1983 he

began developing a box that would attach to handsets and operate with Centrex service. Dan Kranzler, now president of AccessLine, became employee number 18 at McCaw Cellular when his northwestern paging company was purchased by McCaw. There he helped grow the company's paging, and later cellular, businesses. Frustrated by the complexity of managing multiple messaging systems and impressed with the patents and technologies at AccessLine, he joined it in 1986, and helped redesign the system to eliminate the box at home. AccessLine has under 100 full-time employees and is privately held; Kranzler is the largest shareholder.

The first AccessLine service was offered by CellularOne (a McCaw property) in Seattle in 1989. AccessLine has licensed its technology to many carriers, including Bell Atlantic, SNET and McCaw; others, including several large Canadian carriers, are to be announced soon. For an extra fee, carriers can have exclusive rights to the technology in their territory.

Dan Kranzler recently forgot to turn his pager off during a flight and received an AccessLine page that informed him a caller was on hold for him. He picked up the AirFone, dialed in, and was connected to the caller.

Kranzler points out that carriers that introduce features one at a time -- without thinking through the transformative nature of complete integration -- are likely to blow the opportunity and turn off potential subscribers. He sells AccessLine to carriers by arguing that a single, coherent offering will greatly increase service penetration. He also challenges user companies to build a comparable system in-house.

In a sense, AccessLine seeks to provide an intelligent assistant, much as Newton does (see **Release 1.0**, 12-92). But as seems to be true of most phone guys, AccessLine isn't really considering the possibilities of using a powerful device in the users' hands, nor is it working on links to e-mail yet. Instead, the company is working on speech recognition and "voice icons" -- common ways of issuing certain commands. The argument runs: Why bother buying a personal communicator for $700 when $12.50 per month buys you most of the features?

AccessLine goes a long way toward making our messed-up infrastructure easy to use, including detecting when your carphone is activated -- a good time for some system to ring your phone and read you the traffic report and any stock highlights -- and setting up a daily schedule (I leave home for the office at 8, get home by 6; do not disturb me during dinner from 8 to 9, after that only friends or family members). This may work for people with stable routines, but active subscribers still have to call in when they change status. The combination of AccessLine on the network cloud and a PDA in the hand could eliminate the rough edges, providing dynamic profile and status updates based on a user's activity and calendar.

Thorny issues and trusted intermediaries

We will continue to cover unified messaging and address such issues as multimedia message exchange, directory services and media conversion (e.g., OCR systems that turn faxes into text, which can then be spoken; speech recognition that turns spoken words into e-mail). If the right components aren't put together in a useful way, messaging will only become more complex; no transformation will take place. If it does succeed, other problems arise: Some people will have access to an increasingly sophisticated communications environment; those less fortunate will be left outside. How low will prices go? Will there be guaranteed public access or a base public service level? The social implications are enormous.

The goal of unified messaging is to create value and eliminate communication friction. That means creating new opportunities for communication, enriching current ones, and eliminating delays and nuisances such as beepers, call waiting, call screening and junk faxes. So far the record is grim: Technology is perceived to be transforming our world into a place where people have nowhere to hide, no downtime and no help coping with the rising volume of messages.

The threat to privacy and confidentiality has put a damper on technologies such as Caller ID and X.500 directories. People don't want their numbers handed out indiscriminately; companies don't want to give competitors access to sensitive information. Viruses and crackers also discourage freewheeling use of electronic messaging systems. As a result, there is a business opportunity for trusted messaging intermediaries. One variety, described in **Release 1.0**, 6-91, would pay consumers for the right to send them promotional materials. HomeFax' model (**Release 1.0**, 12-91) works roughly that way (consumers don't get paid, but they get use of the fax as consideration for receiving ads).

Another option is managing sensitive but distributed corporate information, such as pricing tables, product brochures or configuration tools (see Trilogy, **Release 1.0**, 7-92), directories, schedules and user profiles. Some of this is already happening over EDI networks or through private agreements, but it is hard to set up and is usually limited to a single message system. Increasingly, companies are outsourcing the management of systems that are not central to their business, permitting their workers to focus their efforts on higher-payback projects.

Release 1.1

December's **Release 1.0** described ClearBoard, an NTT prototype that addresses human-factors issues of eye contact during videoconferencing. Because of poor screen legibility, NTT has shelved the ClearBoard project and turned its attention to other multimedia projects. However, Xerox EuroPARC has a project called VideoTunnel that addresses the same problem by projecting the remote video image on a translucent surface in front of the local camera lens, so it looks like the parties have eye contact. In December we also omitted the name of the company that developed the ACT package. It is Contact Software International.

RESOURCES & PHONE NUMBERS

Dan Kranzler, **AccessLine Technologies**, (206) 654-1000 voice/fax (his AccessLine)
Deborah Mills-Scofield, **AT&T**, (216) 348-6763; fax, (216) 775-2254
Jeffrey Crowe, Tom Glassanos, **Edify**, (408) 982-2000; fax, (408) 982-0777
David Cork, Tony Bawcutt, **Mitel**, (613) 592-2122; fax, (613) 592-4784

COMING SOON

- *Simulation for education.*
- *Pen stuff.*
- *Performance support.*
- *Synchronization and reconciliation.*
- *Directory services.*
- *Community.*
- *Constraint-based reasoning.*
- *And much more... (If you know of any good examples of the categories listed above, please let us know.)*

Release 1.0 is published 12 times a year by EDventure Holdings, 375 Park Ave., New York, NY 10152; (212) 758-3434. It covers pcs, software, CASE, groupware, text management, connectivity, artificial intelligence, intellectual property law. A companion publication, Rel-EAST, covers emerging technology markets in Central Europe and the Soviet units. Editor: Esther Dyson; publisher: Daphne Kis; contributing editor, Jerry Michalski; circulation & fulfillment manager: Robyn Sturm; executive secretary: Denise DuBois; editorial & marketing communications consultant: William M. Kutik.
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PC FORUM UPDATE: CONTENT IS KEY

Where can you go when the software business is dominated by giants? many smaller companies are asking these days. As we survey the pc establishment, we see discomfort and even despair over the increasing power of Microsoft. Build a cool application, the theory goes, and it will find its way into Microsoft's next OS or application suite. There's no way to win.

Of course there isn't, if you keep playing the same mug's game. The next PC Forum is about a new game, one of inherently fragmented, discrete markets where smaller players can carve out a lucrative, satisfying niche, markets where size bestows no advantage and where the absolute returns in each individual niche don't justify investment by a giant. It's also about the necessary infrastructure that will support the delivery of content — and flexible communications among the people who create and use it.

Content is not just jazzy multi-media that performs great demos, but useful business information embodied in software that performs actual work. Aside from its potential value to users, the appeal of content to vendors is that it may provide sanctuary and even opportunity for the smaller software company in a business dominated by giants. Content is inherently specific; the "content" market is a collection of niches.

By contrast, the communications market, which we also cover in depth, requires nationwide and ultimately global connectivity and infrastructure – and business alliances. The clever players in the pc community are expanding their reach to include communications; at the Forum and in the market, they will find many telephone-oriented companies and start-ups already there.

The Forum also includes a special panel called "Platforms for Communication: Designing the Electronic Frontier." In this year of political change, the computer industry (broadly defined) has a unique opportunity to influence the development of the nation's communications infrastructure. What technologies and standards make sense? Who should provide them, and under what regulatory constraints (if any)? As both provider and user, the computer community has a broad interest in these questions. Three industry leaders are scheduled to discuss their views with Representative Edward Markey (D-Mass), chairman of the House Subcommittee on Telecommunications and Finance, in a panel led by Mitchell Kapor, founder and chairman of the Electronic Frontier Foundation.

Our program this year includes a record number of new speakers:

Jim Allchin	Microsoft
John Atcheson	MusicNet
Dick Brass	Oracle Data
Jim Cannavino	IBM
Chuck Digate	Beyond
Donna Dubinsky	Palm Computing
Bob Epstein	Sybase
Connie Galley	TSI International
Robert Growney	Motorola
Joe Guglielmi	Taligent
Jeff Hawkins	Palm Computing
Dick Horn	Comware
Mitchell Kapor	EFF
Bob Kavner	AT&T Systems
Ken Koppel	ContentWare
David Liddle	Interval
Joe Liemandt	Trilogy
Rep. Edward Markey*	U.S. Congress
Craig McCaw	McCaw Cellular
Dave Nagel	Apple
Brett Newbold	Oracle
Marc Porat	General Magic
Vern Raburn	Slate
Tom Ray	Santa Fe Institute
Cliff Reid	Verity
Mort Rosenthal	Corporate Software
Alain Rossmann	EO
Bob Stein	Voyager
Larry Tesler	Apple
John Warnock	Adobe
William Wright	Maxis
Mike Zisman	Soft·Switch

**invited*

Company Presentations in the afternoon will include:

Association for Software Design
Books That Work
BOSS Logic
Folio
Forte Software
Frame Technology
grapeVINE
Interleaf
Hypersoft Ltd.
Knowledge Adventure
MathSoft
PenMagic
Pages Software
Photonics

RELEASE 1.0 CALENDAR

January 25-29	**PenExpo** - San Francisco. Or should it be MobilExpo? Sponsors: Boston University and PenWorld. Call Tom Zaralides, (508) 649-6926 or (800) 733-3593; fax, (508) 649-6926.
Jan 31-Feb 3	***Demo '93** - Palm Springs. Sponsor: InfoWorld Editorial Products Group. Call Tracy McGee, (415) 312-0545.
February 1-4	**ComNet '93** - Washington, DC. Sponsored by World Expo. Keynote by Bob Metcalfe. Call Rachel Winett, (508) 879-6700; fax, (508) 872-8237.
February 1-4	**Object World** - Boston. Sponsor: BU's Corporate Education Center. Call Susan Granata, (508) 879-6700 or (800) 225-4698; fax, (508) 872-8237.
February 3-5	**Infobase 1993** - Salt Lake City. All the world's an Infobase. For Folio users. Call Mike Judson, (801) 375-3700.
February 7-10	**Document and image management systems conference** - Lake Buena Vista. Sponsored by BIS Strategic Decisions. Call Martha Popoloski, (617) 982-9500.
February 16-18	**Downsizing EXPO** - Chicago. Sponsored by Digital Consulting. Call Debbie Silverman, (508) 470-3880; fax, (508) 470-0526.
February 17-19	**ATXPO 93** - Santa Clara. Sponsor: Adobe Technology Exchange. Call Vicki Pedretti, (408) 562-6104; fax, (408) 562-6381.
February 21-24	****EDventure Holdings PC (Platforms for Computing) Forum** - Phoenix (*not* Tucson). "Content is key." Sponsored by us: You read the newsletter; now meet the players and check out some of the wonders described in this issue. The usual suspects, plus Bob Kavner, Craig McCaw, Alain Rossmann, Dick Brass, Tom Ray, Jeff Hawkins, Vern Raburn... Call Daphne Kis, (212) 758-3434; fax, (212) 832-1720; MCI 511-3763.
February 21-26	**Software Development '93** - Santa Clara. Sponsor: Miller Freeman. Call KoAnn Tingley Vikoren, (415) 905-2265; fax, (415) 905-2222.
March 1-4	**OpCon West '93** - Santa Clara. Sponsored by Soft·Letter. Call Tom Stitt, (617) 924-3944; fax, (617) 924-7288.
March 1-5	**AI for applications conference** - Orlando. Sponsor: IEEE. Call Bernadette Minton, (202) 371-1013.
March 3-5	**@Mobile World/Pen-based EXPO** - Boston. Sponsored by Digital Consulting. Call Paul Lamoureux, (508) 470-3870; fax, (508) 470-1992.
March 3-7	***SPA spring symposium** - San Diego. Sponsored by Software Publishers Association. Call Karen Johnson, (202) 452-1600.
March 7-10	***Windows Summit '93** - Carlsbad. Sponsor: CMP Publications, with Windows Watcher Jesse Berst. Call Leasa Mayer, (800) 598-7868 or (206) 441-6448; fax, (206) 441-6369.
March 8-10	**Computer services & consultants executive conference** - Orlando. Sponsor: IBM. With James Cannavino, William Filip, Joseph Guglielmi, Ellen Hancock. Call Hal Topper, (404) 238-4228.
March 8-12	**INTEROP 93** - Washington, DC. Sponsor: Interop/Ziff. Call Lisa Morgan, (415) 962-2520; fax, (415) 949-1779.
March 9-12	***Third Computers, Freedom and Privacy conference** - San Francisco. Communication, privacy and the global network: Social

	responsibility can be fun! Sponsored by ACM. Call Bruce Koball, (510) 845-1350.
March 14-16	**Inside the yellow pages '93** - Boston. Sponsored by Communications Trends/SIMBA. Call Elaine Rosa, (203) 358-9900.
March 15-16	**@Lap & Palmtop portable computing and communications conference and expo** - New York City. Sponsor: Laptop Expositions. Call Fred Schuler, (212) 682-7968; fax, (212) 867-8277.
March 15-17	**@Workgroup computing** - Washington, DC. Sponsored by Digital Consulting. Call Debbie Silverman, (508) 470-3870; fax, (508) 470-0526.
March 15-19	**UniForum 1993** - San Francisco. Sponsor: UniForum. Call Ed Palmer, (408) 986-8840, (800) 255-5620; fax, (408) 986-1645.
March 22-24	**On-line Publishing '93** - Pittsburgh. Sponsor: Graphic Communications Association. Call Marion Elledge, (703) 519-8160; fax, (703) 548-2867.
March 24-31	**CeBIT '93** - Hannover, Germany. Sponsor: Hannover Fairs USA. Everything you're interested in, and a lot more. Call Mette Fisker Peterson, (609) 987-1202; fax, (609) 987-0092; Geide Schlichting, 49 (511) 89-0; fax, 49 (511) 89-3 2626.
March 28-31	**ITAA spring management conference** - Orlando. Sponsor: Information Technology Association of America. Call Shirley Price, (703) 284-5355; fax, (703) 525-2279.
Mar 30-April 1	**Intermedia** - San Jose. Sponsor: Reed International. International conference & exposition on multimedia & CD-ROM. Call David Bradway, (203) 352-8243; fax, (203) 352-8445.
Mar 31-April 3	**Seybold Boston** - Boston. Electronic publishing in all its glory. Sponsored by Seybold Seminars. Call Beth Sadler or Kevin Howard, (310) 457-5850; fax, (310) 457-4704.
April 14-16	**Electronic Data Interchange** - San Antonio. Sponsored by the Data Interchange Standards Association. With Joseph Brophy of Travelers Insurance. Call Connie Shaw, (703) 548-7005.
April 18-23	***Marathon Week** - Boston. Sponsor: Patricia Seybold's Office Computing Group. Open Systems Forum, Seybold Executive Forum and Distributed Object Computing Technology Forum all encapsulated into one week. Come inherit some wisdom! Call Deborah Hay, (617) 742-5200 or (800) 826-2424; fax, (617) 742-1028.
April 19-22	**Supercomm** - Atlanta. Sponsor: U.S. Telecommunications Association. Call Tanya Persensky, (202) 835-3264.
April 19-23	**Object Expo** - New York City. Sponsored by SIGS Publications. Call Cindy Baird, (212) 274-0640.
April 24-29	***INTERCHI '93: Human factors in computing systems** - Amsterdam. Interfaces and intelligibility. Sponsored by ACM. Call Carol Klyver, (415) 738-1200.
April 25-28	**World Computer Law Congress '93** - San Diego. Sponsor: Center for Computer Law. Call Michael Scott, (213) 689-5186; fax, (213) 623-4581.
April 26-30	***COMTEK '93** - Moscow. Co-sponsored by ComputerLand/Moscow, Business Week, PC Week/USSR, Crocus International. Contact: Mike Driscoll, (203) 834-1122; fax, (203) 762-0773.
April 27-28	**Monterey software conference** - Monterey. Sponsored by Digital Consulting. Call Debbie Silverman, (508) 470-3870; fax, (508) 470-0526.
April 28-30	**Asilomar Microcomputer workshop** - Asilomar, CA. Sponsor: IEEE. Call Brian Berg, (408) 741-5010.

May 3-5	***Workflow conference** - Boston. To coincide with LotusWorld; sponsors Action Technologies, PC Week. Call Donna Buckmaster, (510) 769-9627 or (800) 967-5356; fax, (510) 769-9658.
May 3-6	**DB/EXPO 93** - San Francisco. Sponsored by NDN Enterprises. Keynote speakers include Bill Gates, Steven Jobs, Philippe Kahn. Call Jill Reynolds, (800) 232-3976 or (415) 966-8440; fax, (415) 966-8934.
May 4-6	**LotusWorld** - Boston. Sponsor: Danieli & O'Keefe Associates. Call Jackie Rawlings, (508) 443-3330; fax, (508) 443-4715.
May 10-11	**GroupWare '93 Europe** - Frankfurt. Sponsor: The Conference Group. Contact: David Coleman, (415) 282-9151; fax, (415) 550-8556 or Jim Burks, (602) 661-1260; fax, (602) 661-0449.
May 18-20	**Wireless Datacomm '93** - San Jose. Sponsored by Communications Events. Call Linda Hanson, (203) 847-5131.
May 24-27	**Comdex/Spring and Windows World** - Atlanta. Sponsored by The Interface Group. Call Elizabeth Moody, (617) 449-6600; fax, (617) 444-0165.
June 6-9	***SPA Europe's annual conference** - Cannes. Sponsored by Software Publishers Association. Contact: Ken Wasch, (202) 452-1600; fax, (202) 223-8756; Vivianne Lemonnier, 33 (1) 4692-2703; fax, 33 (1) 4692-2531.
June 14-17	**Electronic Messaging '93** - Atlanta. Sponsored by The Electronic Mail Association. Call Mike Cavanagh, (703) 875-8620; fax, (703) 522-0241.
June 29-30	**Lap & Palmtop portable computing and communications conference and exposition** - Anaheim. Sponsor: Laptop Expositions. Call Fred Schuler, (212) 682-7968; fax, (212) 867-8277.
June 29-July 1	**PC EXPO** - New York City. Sponsored by Bruno Blenheim. Call Annie Scully, (201) 346-1400 or (800) 829-3976; fax, (201) 346-1532.
July 13-15	**AAAI/IAAI 93** - Washington, DC. Sponsored by The American Association for Artificial Intelligence. Call Carol Hamilton, (415) 328-3123.
August 9-12	**Groupware '93** - San Jose. Sponsored by The Conference Group. Contact: David Coleman, (415) 282-9151; fax, (415) 550-8556 or Jim Burks, (602) 661-1260; fax, (602) 661-0449.
Aug 29-Sept 3	**International joint conference on artificial intelligence** - Chambery, France. Sponsor: French Association for Artificial Intelligence and a host of others. Contact: Catherine Vidonne, 33 (79) 356-622; fax, 33 (79) 613-792; e-mail, vidonne@imag.fr.
Aug 30-Sept 2	**OpCon East** - Cambridge. Sponsored by Soft·Letter. Call Tom Stitt, (617) 924-3944; fax, (617) 924-7288.
September 19-21	***Agenda 93** - Scottsdale, AZ. Sponsor: InfoWorld Editorial Products Group. Call Tracy McGee, (415) 312-0545.
September 21-23	**UNIX EXPO** - New York City. Sponsored by Bruno Blenheim. Call Annie Scully, (201) 346-1400 or (800) 829-3976; fax, (201) 346-1532.
October 5-7	**NetWorld 93 Dallas** - Dallas. Sponsored by Bruno Blenheim. Call Annie Scully, (201) 346-1400 or (800) 829-3976; fax, (201) 346-1532.
October	****East-West High-Tech Forum** - Ljubljana or Sofia. Sponsored by EDventure Holdings. The fourth annual event focused on emerging computer and data communications markets in Central Europe and the CIS, for vendors and value-adders. Come dis-

	cover new markets that aren't yet saturated, and new companies that aren't yet jaded. Call Daphne Kis, (212) 758-3434; fax, (212) 832-1720.
October 10-13	**SPA fall symposium** - Chicago. Sponsored by Software Publishers Association. Call Karen Johnson, (202) 452-1600; fax, (202) 223-8756.
October 19-21	**PC EXPO** - Chicago. Sponsored by Bruno Blenheim. Call Annie Scully, (201) 346-1400 or (800) 829-3976; fax, (201) 346-1532.
October 24-27	**ITAA management conference** - Seattle. Sponsor: Information Technology Association of America. Call Shirley Price, (703) 284-5355; fax, (703) 525-2279.
October 25-29	***INTEROP 93** - Paris. The mother of all networking conferences, now global. Sponsor: Interop Europe. Contact: Carinne Propper, 33 (1) 4639-5656; fax, 33 (1) 4639-5699.
November 7-10	**GeoCon/93** - Cambridge. Sponsored by Soft·Letter. Call Tom Stitt, (617) 924-3944; fax, (617) 924-7288.
November 14-18	**Hypertext '93** - Seattle. Sponsor: ACM. Call Steve Poltrock, (206) 865-3270.
November 15-19	***Comdex** - Las Vegas. Start planning for next year! Contact: Peter Young at Interface Group, (617) 449-6600; fax, (617) 449-6953.

Please let us know about events we should include. -- Denise DuBois

**Events Esther plans to attend.*
@Events Jerry plans to attend.
Lack of a symbol is no indication of lack of merit.

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